

U. S. Branch Mint

New Orleans, April 1st 1851.

Dear Sir,

Your favour of the 22nd ultimo was duly received, and I will give you a concise description of my manner of working, when I experimented upon the McCulloch process, at the request of the commission, and which resulted in refined gold of unexceptionable quality, toughened by simply melting with the usual quantity of flux (bismuth & nitre, equal parts) in a black lead pot. Long before I heard of my new method of refining, I tried experiments with a view to avoid the use of silver, the waste of which has always been a source of uneasiness and apprehension to me. I alloyed gold with lead and separated it with nitric acid, and I also tried to dissolve the argentiferous gold in nitro-muriatic acid. My results were unsatisfactory. When the McCulloch process and your own became known to me, I was anxious to try them. I made several unsuccessful experiments with the M.C. process on a small scale (an ounce or two), which I attributed to the imperfection of the granulation

and which induced me to repeat the experiments on larger quantities (20-30 ounces), and to pay particular attention to the granulation. Four lots of gold were alloyed with $2\frac{1}{2}$ & $3\frac{1}{2}$ parts of zinc and granulated. The alloy was separated and toughened in cast-iron at one melting. A good while after, having mentioned the success of the four above mentioned experiments to Mr. Mac, I was requested by him to try his process on a large scale. I did so: I alloyed two thousand ounces of gold with zinc, making four granulation melts of that, one of which I regarded as imperfect, and worked them off in a manner nearly the same as that in which I worked the small lots, and failed in every attempt to toughen the gold. I should mention that among many other fluxes I employed sal. ammoniac, phosphate of soda & ammonia, and finally added a reasonable quantity of copper, incorporating it with the gold at the highest possible temperature of my furnaces and added repeated doses of nitre and borax. But after a long continued working with nitre, the gold remained the same, and if possible more brittle than before. I was nearly

hydrochloric acid. I neutralized the liquor with ammonia, and tested for zinc with NH_4S . Upon the first trial the liquor contained a considerable quantity of silver & zinc; I continued the boiling of the bottles in the salt water bath, until I could no longer find any zinc by the above mentioned plan, when I desisted, & washed the gold. The gold has a most beautiful appearance. After drying I incorporated it well with about one half of its volume of coarsely pulverized nitre and borax, and melted it down in the usual way, when it was found to be tough and of 995th fineness.

My apparatus for working with the nitric acid is not well suited on account of the difficulty and risk of stirring up glass matropes, which is essential to insure the complete abstraction of the zinc, the smallest trace of which will render the gold brittle. As I remembered^{rightly} yourself or some of your men told me that you always added copper to the fine gold to toughen it the more readily, in some of my unsuccessful operations with the Mac. process, I tried it, but it was of

no use. From the publication of Mr. Mellish's
suggestion of the
I see that the use of mineral acid is dis-
claimed by yourself & Mr. M. C. I think
the suggestion came from me, I have frequently
and it with the most beneficial results. In
separating base bars by the solution-quickly
process I have occasionally met with a very
fine, light, dark-coloured powder mixed with
the gold, and going to the whole of the gold
the same dark appearance; the presence of this
dark powder (which may be a combination of
gold with tin) renders the following, i.e. the
elaboration on a filter, very laborious and
imperfect. - In such a case it has been
and is now my practice, to wash the gold
by & by affusion and decantation, allowing
the ~~residue~~ to deposit the fine powder,
and leaving the dark coloured gold with
mineral acid, which decomposes this dark
powder which is unattainable in HCl , and
residue gives the gold immediately a beautiful
colour, and increases its toughness. Before
I employed mineral acid, I always encountered
difficulty in toughening the gold obtained
by separating jewellers bars & the like, but
the use of mineral acid removes all difficulties,
I think I mentioned this to Mr. Monnell, who

is your friend.

I cannot tell you what the ex-
pense was on my experiments, as I did
not institute them with a view to ascertain
the economical value of the process, but merely
try how it would work; knowing that expense
was being made at the parent mine, and
that, of course, a change from the present method
of refining would only be ordered by the
director, after a series of satisfactory experiments.
I conducted myself with becoming familiarity with
the particulars of the process, in order to work
with it more successfully, should its adoption
be ordered by the director.

But relevant to the tin, I have not known
anything further, except that I was told
that the same was also found somewhere
in Arkansas, that the region where it
arises, has been explored, but that the
explorers had not been able to find its
locality. I first heard of tin coming from
the interior of Mississippi, & that it was
brought down the Mississippi river to Lake
Pontchartrain by Indians, and I remember
a sample, some 4 years ago, as coming
from that source. I have made some
inquiries of persons employed in Lake

navigation, but could not learn anything from them. — If I should succeed in finding out its locality, I will let you know with pleasure. —

Please give my respects to Major Patterson, Raleigh.

Yours very truly

Chas. F. Bonzans

To Professor J. C. Booth
Philadelphia.

Chas.
F. Bonzans
Nov 14 1857

discouraged; but tried the process again, and a lot of was done, and succeeded perfectly.

I will now point out to you, what I deem essential to success: In granulating, the greatest power is required, (the first granulations I made, were heavy round shot, they retained their original form after the action of the sulphuric and nitric acids, and the gold could not be toughened on account of its retaining form), and I think that much depends upon the quality of the zinc employed, the absence of tin is best, the former especially, being an indispensable condition.

The alloying is best done by melting the gold and zinc separately, and pouring the former into the latter while constantly stirring. The metal should not be poured before it has cooled down below a red heat, at least the metal should not appear red-hot in the day-time.

The granulated mass will then be very light. Unless the granulation is perfect, it is of no use to attempt toughening the gold. For "working" the granulated metal in the acid I used a large copper pan 6 ft. in diam. & 18 in. high, mounted on 3 iron posts so as to allow of small furnaces being placed under it. I filled the pan with water and added the sulphuric acid, until the

effervescence became very lively, and adding more
air when it became less so. I disposed ^{partially} of the
very disagreeable hydrogen gas, by setting fire to
it. — After a couple of hours the granulated
metal was reduced to a powder; the sol. of
sulph. silver was drawn off, the powder disin-
tegrated still further by rubbing it with a
wooden spatula. The pan was again filled
with hot water, air added, and heat applied
by means of 3 little ^{portable} furnaces, such as I use
for drying the reduced silver; — After an
hour or so I decanted the liquor, washed
the gold with hot water, and transferred
it to 12 glass matrasses. I now put
on a reasonable quantity of nitric acid
and applied heat by means of a salt-water
bath. — Some two hours after the addition
of the nitric acid I examined the bottles
and found, that the nitric acid had not
penetrated through the entire mass of the
gold, but only acted upon its surface.
The powder was packed so densely, that the
upper portion only was acted upon to a
depth of about an inch, which was very
apparent from the difference in colour. I
therefore stirred the bottles repeatedly until
I considered that the whole mass had been
uniformly acted upon, when I took out
a portion, rubbed it well in a mortar,
transferred it to a small porcelain basin,
boiled it with strong nitric acid, & decanted
the liquor for the purpose of examining whether
the acid had dissolved out any thing more.
The liquor contained silver which I ppt with